Tejp: Designing for Embodied Interaction with Personal Information Layers in Public Spaces

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ABSTRACT
The project Tejp explores various possibilities for overlaying personal traces on public spaces through physical interaction and parasitic methods. A series of low-tech prototypes drawing inspiration from existing urban practices, are tested in real settings with the general public. We stage the prototypes as props and people as performers to discover and uncover emerging behaviours, and to derive design implications for location-based information systems that make full use of the physicality of public spaces.

Keywords
Embodied physical interaction, personalisation of public space, physical environment, location-based information systems, interaction design, urban sub-cultural practices

1. INTRODUCTION

1.1 Motivation
Prompted by the excess of commercial media pervading the public arena, the research and design project *Tejp* aims at encouraging playful ways for indivduals to personalise territory and at providing a space and sounding board for existing social relationships between residents, passers-by and potential players in the public arena. The aim of the project is to provide technological tools and situations for layering personal traces on public physical spaces for others to discover. We promote technologically enabled personal expression that can happen any day, in any public space without the need for group organization or ownership of specific devices.

Builiding upon existing alternative channels of public expresion and communication for everyday people such as graffiti, stickers, posters and bulletin boards, we perform a series of experiments by deploying low-tech prototypes in the public realm. This allows us to explore various types of physical interaction for authoring, layering and accessing digital information on public space, and to uncover how this interaction influences meaning, content and user's behaviour.

Figure 1. Found example of existing parasitic means of personalising public space.

1.2 Related Work
Tejp is related to projects in the fields of ubiquitous computing and augmented reality [e.g. 5, 9 11 12], interaction design [e.g. 1, 6, 7] and in particular to location-based information systems [e.g. 4], which connect digital information to physical space. For example, the project Hear&There enables people to leave virtual audio imprints at particular places, with content that is created by the users themselves, located with GPS on a map through a PDA, and accessed through headphones. GeoNotes focuses on the "communicatory, social and navigational implications of the mass usage" [4] of text-based systems, addressing the issue of information overload and introducing the notion of social filtering.

In Tejp, we concentrate on the tangible and semantic aspects of interaction between the user and that information space, and take advantage of the physicality of the environment. The ultimate goal is to facilitate the personalisation of public spaces by everyday people, exploring parasitic communication as means of adding and revealing layers of content on physical space.

1.3 Approach
Each place has emotions, meanings, and content that are related or attributed to them. These are linked to the context in which they are created and are affected by the cultural and cognitive filters through which they are perceived. For example, the interpretation of traffic signs depends upon placement and knowledge of traffic laws. Reciprocally, their presence determines the use and meaning of crossroads at which they are placed. Inspired by parasitic media theory [10] and the work of the Situationists [2], we are interested in the creation of new such layers of content for places, without altering their intrinsic structure or function (Fig. 1). We aim at providing people with a means of superimposing personal layers of content on the physical environment (like communities do with stickers and posters, f. ex.) as well as revealing hidden layers of

understanding (as if x-raying unperceivable facets of reality in public spaces), thereby supporting the insertion of new meanings into places and their personalisation.

In terms of content, we recognise the need for incorporating dimensions of subtlety, abstraction and even poetry or subversion into the palette of possibilities, in order for such systems to be meaningful for user. Technology, body, media and context of use play a major role in how the user can express themselves with location-based information systems, mostly due to the fact that the interaction they enable can limit, widen or at least influence content and engagement. Hence, there is a strong need to focus on and explore more physical, embodied means of layering information on physical space, instead of assuming the prevalence of screen-based interaction with PDAs or head-mounted displays.

Rather than focusing on the technology or prescribing interaction procedures, we design a space of possibilities for the interaction to take place within and for meaningful, embodied use to emerge. Through the exploration of this space, we aim to derive informed design implications for location-based information systems, enabling the communication of personal experience and expression.

2. METHOD

The methods we employ actively involve people as performers in an iterative prototyping process, while permitting and encouraging the public to expand their notions of what is permissible in the public realm.

2.1 Low-Tech Prototypes as Props

In order to explore new and provocative ideas about authoring, accessing and layering digital information on public physical space as well as the behaviours this incurs, we created a series of various low-tech prototypes to test on-site with users.

These prototypes are used as props, allowing us to gain insight into the user's motivations and experiences by observing how people interact with them in real settings. Thereby, we explore how the physical attributes of the props and the technological options we propose through them influence information content, users' behaviours and conveyed meaning. Performing these experiments in the public setting also reveals the relationship between these aspects of interaction and the actual context of use.

In each case, we focus on different design parameters, such as the medium that is used or the synchronicity of the communication. These parameters are not orthogonal in terms of their influence on the resulting interaction, preventing us from isolating them and testing each parameter one at a time. Therefore we incorporate redundancy in the design of the prototypes as a means of confirming relationships of cause and effect through reoccurring patterns.

2.2 Designing for Embodied Interaction

We are designing for natural, embodied interaction [3] to occur, both socially and cognitively, with potential for adoption into everyday life. Therefore, it is important for the prototypes to be open, tangible [8] and inspired by existing cultural practice.

2.2.1 Tangibility

Designing for this context of use implies embedding the physicality and use of the devices into the physical environment. Instead of being displayed on PDA screens or virtual acoustic spaces, the content they convey are mediated as parasites of physical media and existing urban structures. The prototypes build upon those structures (walls, urban furniture, existing web of mobile communications, electrical apparatus, etc), using them as support by incorporating them into their functionality.

2.2.2 Openness

The prototypes are voluntarily kept simple in order to focus upon the interaction rather than the technology they represent. Each of them only hints at the nature of their application without imposing a procedure of use. Thus, they are open to unexpected emerging uses and behaviours, leaving space for appropriation and adaptability, as well as honest engagement, both experientially and creatively.

2.2.3 Cultural Grounding

The physical attributes of the prototypes, appearance, possible modes of interaction, and placement are inspired by existing urban practices and street culture, in order to ground the experiments in real people's understanding of public places and the urban environment.

Although emerging sub-cultural issues already play critical roles in our society, they are usually given little design attention. We access current communication procedures taking place in the public space by performing observations of sites and behaviours, as well as interviews of traditional and alternative, amateur and established street and graffiti artists. This gives us insight into sub-cultural motivations and perception of current modes of public messaging, as well as a confirmation of the need for new alternative channels. Building upon everyday urban (mal)practices and aesthetics of use, we allow for new experiences and ways of communicating, sharing, or revealing to occur.

2.3 Testing and Derivation of Design Implications

The prototypes are tested on site through specifically crafted tactics and placement. Testing procedures and experiments range from outdoors workshops, to stakeouts and video filming. A dozen of users are involved in order to ensure a certain critical mass, all of which are also asked to document their own experience with photographs, narratives, drawings, etc. Accidental protagonists are also observed.

We then derive design implications based upon reoccurring patterns of people's (mis)use of the prototypes and emerging narratives.

3. PROTOTYPES

Our series of prototypes vary in terms of technology, appearance, interaction and theme. They range in themes from intimacy and public interruption to give-and-take and hacking, exploring notions of appropriation, meaning of places and situations, and social rituals. The two following prototypes are described more in-depth as first examples of this series.

3.1 Tejp 1: Audio Tags

An *audio tag* is a small box containing an audio message that once recorded can be left at hidden places in public spaces. This personal message is whispered to by-passers as they lean towards the device. People then have the possibility to record over the existing messages with their own.

The prototypes, which are made from hacked low-cost gadgets, contain a sampler buffer, a small microphone, a small speaker, an IR proximity sensor and a recording button (Fig. 2). People can record their message by holding the button pressed, and fix the

tags on walls or other structures in urban environment. The proximity sensor triggers the playback of the audio recording when someone is in its proximity. The size of the devices is about a few cm^3 only.
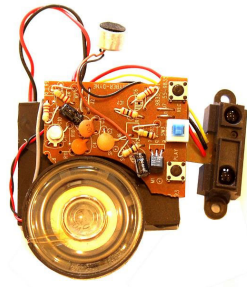

Figure 2: Electronics of an audio tag

3.2 Tejp 2: Glitch

In *Glitch*, interference caused when passers-by receive incoming messages and phone calls, are loudly broadcasted at a public place with high traffic potential, such as bus stops or busy street corners. If the speaker array is f. ex. linearly disposed along a usual pedestrian path, the glitches stalk the mobile user during the whole phase of mobile communication initiation.

The prototypes are arrays of powered-on loudspeakers picking up electromagnetic interferences from mobile phones. The experiment is split into two separate prototypes: one using a standard antenna and installed in a grid formation, and another one parasiting off existing metallic urban structures such as fences or rubbish bins in the city, re-using them as antennas (Fig. 3).

Figure 3: The two versions of Glitch: using a standard antenna and parasiting a metallic fence.

4. DESIGN SPACES

The aspects that these prototypes explore vary in terms of physical attributes, medium, and explicitness, affecting the type of content, emerging behaviours, and meaning that result from our experimentation. Mapping the design factors and test results to each other allows us to derive general design implications for embodied interaction with location based information systems.

4.1 Exploration Space

4.1.1 Audio Tags

Audio tags illustrate the notion of overlaying personal traces. Their small size yet identifiable design keeps their discovery serendipitous. By being placed on the physical environment and only making themselves heard within a certain radius, the tags open a space of intimacy inside the public realm.

The design of the audio-tags incorporates the following aspects:

- explicit vs. implicit interaction: leaning toward a wall to listen vs. triggering the audio by accident when just passing by in front of it
- small size factor, implying discreteness
- sound as media
- physical structures, such as walls, as a support to parasite
- asynchronous, distributed communication

4.1.2 Glitch

As opposed to overlaying information, Glitch is about revealing a hidden layer of personal communication in public space. Following the situationist tactic of détournement [2], it re-situates a familiar auditory phenomenon usually taking place at homes or offices, into the unexpected setting of outdoor urban environments. As the nature and origin of the noises are familiar to most people and easily identifiable, yet the speakers remain hidden, a situation of interruption is created, highlighting the virtual and pervasive layer of mobile phones communication.

Glitch is designed taking the following parameters into consideration:

- abstracted content, in the form of electroacoustic glitches
- sound as media
- electromagnetic bandwidth for mobile communication as a support to parasite
- synchronous, mobile communication
- recycling of urban structures as a part of the device

4.2 User Engagement Space

Observables of people's involvements inside the design parameters we have created are content, placement, modes of initiation, and interaction behaviours. People's perspective of the experiment can change depending on what role they play, from placers and seekers (insiders actively engaged in the experiments) to accidental finders (outsiders in the general public).

4.3 Analysis Space

The analysis of the observations is concerned with:

- types of emotion and meaning conveyed by the content
- relationships between content and placement, thus between meaning and context
- reactions to sound as media
- changed perception of place when interacting with device
- feelings of intimacy vs. disturbances as result of discreteness and initiation modes
- influence of the physicality of the device on the interaction

5. CONCLUSION

We introduced the project Tejp, which explores various possibilities for overlaying personal traces on public spaces through a series of on-site experiments. By focusing on tangible interactions between the user and the information space and grounding the experiments in cultural understanding of existing urban practices of personal expression, we design for embodied uses, meaningful content and interesting behaviours to emerge. Obvious issues of legality, acceptance, and fear of electronic objects deployed in the public realm are present and need to be addressed and solved. Ultimately, the results of the experiments

will derive informed design implications for location-based information systems.

6. ACKNOWLEDGMENTS

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